IQRPE REVIEW
OF THE
HIGH LEVEL WASTE FACILITY (HLW) PULSE JET VENTILATION SYSTEM (PJV) MISCELLANEOUS TREATMENT UNIT SUBSYSTEM ANCILLARY EQUIPMENT

"I, Fred E. Porter, have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review High Level Waste Facility (HLW) Pulse Jet Ventilation System (PJV) Miscellaneous Treatment Unit Subsystem Ancillary Equipment as required by the Dangerous Waste Regulations, namely, WAC 173-303-640(3) applicable paragraphs, i.e., (a) through (g)."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design intent fully satisfies the requirements of the WAC.

The attached review is nine (9) pages numbered one (1) through nine (9).

Job No 24590

Bechtel National, Inc.

SUPPLIER DOCUMENT STATUS

1. [X] **Work may proceed.**
2. [ ] **Revise and resubmit. Work may proceed subject to resolution of indicated comments.**
3. [ ] **Revise and resubmit. Work may not proceed.**
4. [ ] **Review not required. Work may proceed.**

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations

REVIEWED

G-321 Document Category N/A
[From Supplement A to G-321-E (E) or G-321-V (V), as applicable, or "N/A" if SSRS is used]

Supersedes BNI Document No. N/A Rev
[When applicable]

Accepted by DC Pflager (Print Name) (Signature) 10/20/04 (Date)

Released by N/A (Print Name) (Signature) (Date)
[When applicable]

416 GP&S 7-03

EXPIRES 12-04-05

Signature

10-15-2004
Date

24590-CM-HC4-HXYG-00138-02-00048 REV 00A

STRUCTURAL INTEGRITY ASSESSMENT OF THE HIGH LEVEL WASTE FACILITY (HLW) PULSE JET VENTILATION SYSTEM (PJV) MISCELLANEOUS TREATMENT UNIT SUBSYSTEM ANCILLARY EQUIPMENT

COGEMA-IA-073
REV. 0

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Scope	Scope of this Integrity Assessment	This Integrity Assessment reviews miscellaneous treatment unit subsystem ancillary equipment located in the HLW Pulse Jet Ventilation System (PJV) as shown on P&ID drawings 24590-HLW-M6-PJV-P0001/P0002, Process Flow Diagram Drawing 24590-HLW-M5-V17T-P0005, and as defined in the System Description for the HLW Pulse Jet Ventilation System.
References	Drawings and System Description	Drawings: 24590-HLW-M6-PJV-P0001, Rev. 0, P&ID - HLW Pulse Jet Ventilation System Collection & Conditioning; 24590-HLW-M6-PJV-P0002, Rev. 0, P&ID - HLW Pulse Jet Ventilation System Filtration & Monitoring; 24590-HLW-M5-V17T-P0005, Rev. 0, Process Flow Diagram HLW Nitrification Pulse Jet Ventilation Treatment (System PJV); System Description: 24590-HLW-3YD-PJV-00001, Rev. 0, System Description for the HLW Pulse Jet Ventilation System (System PJV); System Description Change Notice (SDCN): SDCN No. 24590-HLW-3YN-PJV-00001 for System Description No.24590-HLW-3YD-PJV-00001, Rev. 0.
Summary of Assessment		For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design controls and requirements to ensure the design intent fully satisfies the requirements of Washington Administrative Code, WAC-173-303-640, *Dangerous Waste Regulations* for Tank Systems.

	Information Assessed	Source of Information	Discussion
Design	Ancillary equipment design standards are appropriate and adequate for the equipment's intended use.	Drawings and System Description listed above under References; 24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-PSAR-ESH-01-002-04, Rev.1a, Preliminary Safety Analysis Report to Support Construction Authorization; HLW Facility Specific Information.	The Preliminary Safety Analysis Report to Support Construction Authorization; HLW Facility Specific Information document, and the System Description for the HLW Pulse Jet Ventilation System (System PJV) document identify design codes and quality levels for piping, ductwork and ancillary equipment for the PJV system. The Waste Treatment Plant (WTP) pipe stress design criteria document identifies ASME B31.3 as the design code for piping systems. The P&ID drawings identify the varying Seismic Categories and Quality Levels of the ancillary equipment components. To ensure continued function during normal operations, abnormal operations, and during and after a Design Basis Earthquake, the design requirements for all various Seismic Categories (SC-I, II, III, and IV) are discussed in detail in the Pipe Stress Design Criteria document. The above listed design criteria, codes, and standards are acceptable and adequate for the design of the ancillary equipment for its intended use.
	If the ancillary equipment to be used is not built to a design standard, the design calculations demonstrate sound engineering principles of construction.	ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria."	The ancillary equipment is built to design standards. The Pipe Stress Design Criteria document specifies that piping is to be designed in accordance with ASME B31.3 Code.

	Information Assessed	Source of Information	Discussion
Design	Ancillary equipment has adequate strength at the end of its design life to withstand the operating pressure, operating temperature, thermal expansion, and seismic loads. Equipment is protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.	24590-WTP-DC-PS-01-001, Rev 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, Division 1, Code Case N-411, Subsection NC, Appendix N, and Appendix F, 1995; 24590-WTP-VV-PS-01-001, Rev. 2, Verification and Validation Report for ME101, Linear Elastic Analysis of Piping, Version N8; 24590-WTP-DB-ENG-01-001, Rev. 1B, Basis of Design; 24590-WTP-PER-M-02-002, Rev. 1, Materials for Ancillary Equipment; DOE-STD-1020-94, Natural Phenomenon Hazards Design Evaluation Criteria for Department of Energy Facilities (including Change Notice #1, January 1996); UBC, Uniform Building Code, 1997 Edition.	The Basis of Design document specifies that mechanical equipment is to be designed for a nominal plant life of 40 years. The Materials for Ancillary Equipment document specifies that ancillary equipment downstream of a waste source vessel or miscellaneous plant items is to be constructed of the same or better material and with the same corrosion allowance as the source vessel or plant items, unless the service seen in the downstream line warrants a different material, corrosion allowance, or other modification. The Pipe Stress Design Criteria requires the use of the ASME B31.3 Code and DOE-STD-1020-94 Standard, for piping design. ASME B31.3 requires explicit consideration of operating pressure, operating temperature, thermal expansion and contraction, settlement, vibration, and corrosion allowance in the design of piping. ASME B&PV Code, Section III, Code Case N-411, Subsection NC, Appendix N, and Appendix F, and the Uniform Building Code (UBC) are used to supplement the requirements of ASME B31.3 and DOE-STD-1020-94 for design as applicable to the appropriate Seismic Category of the ancillary equipment. Details of the piping seismic analysis methods are discussed in the Pipe Stress Design criteria document. These are appropriate and adequate codes and standards to ensure that the ancillary equipment has adequate strength at the end of its design life to withstand all anticipated loads.

	Information Assessed	Source of Information	Discussion
Supports	Ancillary equipment supports are adequately designed.	24590-WTP-DC-PS-01-002, Rev. 2, Pipe Support Design Criteria; 24590-WTP-PER-PS-02-001, Rev. 4, Ancillary Equipment Pipe Support Design; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, Division 1, Subsection NF and Appendix F, 1995; 24590-WTP-PL-PS-01-001, Rev. 1, Verification and Validation Test Plan for Bechtel's ME150 Pipe Support Family of Programs (PCFAPPS).	The Pipe Support Design Criteria considers all load types identified in ASME B31.3 and utilizes ASME B&PV Code, Section III, Division 1, Subsection NF and Appendix F to supplement the requirements of ASME B31.3 for seismic design of SC-I/II and SC-III/IV pipe supports. Bounding load cases are passed to the pipe support designers from the results of the ancillary equipment piping stress analyses. Details of the seismic design methodology are discussed in the Pipe Support Design Criteria document. Analysis is by manual calculation and computer programs that have been tested and approved as discussed in the Verification and Validation Test Plan for Bechtel's ME150 Pipe Support Family of Programs. The Ancillary Equipment Pipe Support Design document shows examples of typical equipment supports. Ancillary equipment supports are to be designed in such a way that the heat transferred from supports to the building structure does not raise the building structure temperature to exceed 150°F for concrete and 200°F for steel. These are appropriate codes and standards for design of the PJV system ancillary equipment supports.
Connections	Seams and connections are adequately designed.	24590-WTP-DB-ENG-01-001, Rev. 1B, Basis of Design; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications; ASME/ANSI B16.5, 1988 Edition, Piping Flanges and Flanged Fittings.	The Basis of Design states that in-cell piping that is non-maintainable will be fully welded. The Pipe Stress Design Criteria document specifies the ASME B31.3 Process Piping design code for the piping systems. Welding is to be performed in accordance with the requirements of ASME B31.3 and the ASME B&PV Code, Section IX. Flange connections are to be designed in accordance with ANSI B16.5. These are appropriate codes and standards for design and fabrication of the PJV system ancillary equipment seams and connections.

	Information Assessed	Source of Information	Discussion
Frost Heave	The system will withstand the effects of frost heave.	Drawings and System Description listed above under References; 24590-WTP-DC-ST-01-001, Rev. 3, Structural Design Criteria.	The ancillary equipment associated with the PJV system considered in this assessment begins at the outlet from the fluidics equipment headers and is routed underneath the drum transfer tunnel at an elevation of -10 feet to the pulse vent system HEPA Filter cave at an elevation of 0 feet and on to pulse vent system exhaust fans at elevation 58 feet inside the HLW facility. The Structural Design Criteria requires that all structural foundations shall extend into the surrounding soil below the frost line to preclude frost heave. The frost depth line is 30 in. below grade. The HLW building foundation mat is a thick concrete slab, is not subject to frost heave; therefore, the ancillary equipment located inside the building is not subject to frost heave either.
Waste Characteristics	Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, temperature)	Drawings and System Description listed above under References; 24590-WTP-PER-03-002, Rev. 1, Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems; 24590-WTP-PER-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems.	The PJV System Description identifies the safety function of the pulse ventilation treatment system shown on the P&ID drawings as maintaining air flow from the pulse jet mixers during normal operations, abnormal operations and during and after a Design Basis seismic event. These functions are discussed with respect to vapors and emissions of acutely or chronically toxic (upon inhalation) extremely hazardous waste in the Toxic Vapors and Emissions document. Similar discussions are provided in the Prevention of Hydrogen Accumulation document with respect to ancillary equipment functions related to maintaining hydrogen concentrations below lower flammability limits during normal operations, abnormal operations and during and after a design level seismic event.

	Information Assessed	Source of Information	Discussion
Waste Characteristics	Ancillary equipment is designed to handle the wastes with the characteristics defined above and any treatment reagents.	Drawings and System Description listed above under References; 24590-WTP-PER-M-02-002, Rev. 1, Materials for Ancillary Equipment; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description.	The System Description identifies that additional reagents are not added to the PJV system during normal operations. The PJV system will collect, contain, filter, monitor and discharge exhaust air from fluidics devices, and prevent release of contaminants to controlled spaces. There is a potential for aerosol condensation forming in the piping system and hydrogen accumulation in the pulse jet mixers (PJM's). The P&ID drawings show a drain line at the low point in the system to remove condensate. The exhaust fans operate continuously to ensure that hydrogen will not accumulate in the fluidic devices and ancillary equipment. The Materials for Ancillary Equipment document requires that the material selection and corrosion/erosion allowances for ancillary equipment in contact with the PJV system offgas will be equal to or better than the material and corrosion allowance of the waste source vessels except as noted therein. PJV ancillary system components are to be fabricated of 316L stainless steel as shown in the Piping Material Class Description document for piping class S11Z specified on the P&ID drawings.

	Information Assessed	Source of Information	Discussion
Compatibility	The pH range of the waste, waste temperature and the corrosion behavior of the structural materials are adequately addressed. Ancillary equipment material and protective coatings ensure the ancillary equipment structure is adequately protected from the corrosive effects of the waste stream and external environments. The protection is sufficient to ensure the equipment will not leak or fail for the design life of the system.	24590-WTP-DB-ENG-01-001, Rev.1B, Basis of Design; 24590-WTP-PER-M-02-002, Rev. 1, Materials for Ancillary Equipment; .	The Basis of Design identifies a service design life of 40 years for the ancillary equipment. All non-maintainable items will be designed to last the life of the facility. Detailed material selection (corrosion) analyses are conducted for piping, ductwork and ancillary equipment in the PJV system during process design. The Materials for Ancillary Equipment document requires that the material selection and corrosion/erosion allowances for ancillary equipment in contact with the offgas will be equal to or better than the material and corrosion allowance of the HLW fluidics equipment, except as noted therein. Both internal and external corrosion has been considered for all ancillary equipment, therefore, the ancillary equipment will provide the expected design service life.

	Information Assessed	Source of Information	Discussion
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the ancillary equipment.	24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-DB-ENG-01-001, Rev. 1B, Basis of Design; 24590-WTP-PER-M-02-002, Rev. 1, Materials for Ancillary Equipment; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers.	The Pipe Stress Design Criteria document requires use of the ASME B31.3 Code for ancillary equipment design. Consideration of corrosion, including corrosion allowance, is a mandatory requirement of ASME B31.3. A required service design life of 40 years is identified in the Basis of Design for ancillary equipment located in inaccessible process cells. Detailed material selection (corrosion) analyses are conducted for each ancillary equipment component in the PJV system during process design. The Materials for Ancillary Equipment document requires that downstream ancillary equipment is to be constructed of equal or better material than the source HLW fluidics equipment and with the same corrosion allowance, except as noted therein. Bounding corrosion allowances are listed for each piping material class in the Piping Material Class Description document. The corrosion/erosion allowance for the 316L stainless steel PJV system ancillary equipment is 0.040 in. The material and corrosion allowance are appropriate and adequate for the intended service life of the ancillary equipment.
Strength	Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessels are exceeded.	24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers.	The Pipe Stress Design Criteria document specifies use of ASME B31.3 as the design code for the PJV piping. ASME B31.3 requires provision be made to safely contain or relieve any pressure to which the piping may be subjected. ASME B31.3 piping not protected by a pressure relieving device, or that can be isolated from a pressure reliving device must be designed for at least the highest pressure that can be developed. Bounding pressure and temperature limits are listed for each of the piping material classes in the Piping Material Class Description document.

	Information Assessed	Source of Information	Discussion
Strength	Maximum flows and any unusual operating stresses are identified	Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers.	The expected flow paths for the ancillary equipment are identified on the P&ID drawing. The Pipe Stress Design Criteria document specifies the ASME B31.3 code for piping design. This code requires piping to be designed to the highest pressure that can be developed in a piping system, assuring that maximum operating stresses remain within code allowables. The Piping Material Class Description document lists the bounding pressure and temperature limits for each piping material class.
Secondary Containment	Ancillary equipment is designed with secondary containment that is constructed of materials compatible with the waste and of sufficient strength to prevent failure (pressure gradients, waste, climatic conditions, daily operations), provided with a leak-detection system, and designed to drain and remove liquids.	Drawings and System Description listed above under References.	The ancillary equipment considered in this assessment is located in the inaccessible process cells inside the HLW. Secondary containment for ancillary equipment within the cells is provided by the stainless steel liners plates and sumps and is outside the scope of this integrity assessment.